



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference BP111069/SYMM	FOR FURTHER ACTION		See Form PCT/PEA/416
International application No. PCT/FI2005/000054	International filing date (day/month/year) 28.01.2005	Priority date (day/month/year) 29.01.2004	
International Patent Classification (IPC) or national classification and IPC INV. H02H5/08 G01N33/00			
Applicant ABB OY et al.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 4 sheets, as follows:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p style="margin-left: 20px;"><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. II Priority</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p style="margin-left: 20px;"><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. VI Certain documents cited</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand 29.11.2005		Date of completion of this report 12.04.2006	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized officer Colombo, A Telephone No. +31 70 340-4884 	

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/FI2005/000054

Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

Description, Pages

1-33 as originally filed

Claims, Numbers

1-29 received on 23.03.2006 with letter of 23.03.2006

Drawings, Sheets

14-44 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/FI2005/000054

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-29
	No: Claims	
Inventive step (IS)	Yes: Claims	1-29
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-29
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.

PCT/FI2005/000054

Re Item V

1 Reference is made to the following documents:

D1: **DE 37 02 970 A1** (GAUS, HARRY, DR; DE) 18 August 1988

D2: **US-A-4 562 723** (HUBNER ET AL) 7 January 1986

D3: **US 6 218 951 B1** (COLVIN D, US) 17 April 2001

2 INDEPENDENT CLAIMS 1, 10

2.1 The subject matter of independent claims 1 and 10 is compliant with the requirements of Article 33(1) PCT. Document D3, regarded as the most relevant state of the art, discloses (the references in parentheses applying to this document):

a method for protecting an actuator (80) against failure (Col. 2, Ins 22-24), comprising:

- establishing a norm of factors (Fig. 3a, 3b) affecting the operation of the actuator based on the operating environment of the actuator (Col. 2, 41-48);
- providing the norm with a tolerance (Col. 3, Ins 31-38) defining a condition for the operation of the actuator in the operating environment;
- observing the operation environment of the actuator in order to detect a deviation that falls outside said tolerance (Col. 4, Ins 39-43), the observation being performed by means of an environmental *detector* (Fig. 2) having a sensor member (40) with a first connecting surface (6) and a second connecting surface (3) for feeding a flux through them, an active layer (S1) therebetween which is arranged to cause a change in the flux's passing through the active layer;
- subjecting the active layer (S1) to a component present in the operating environment (Col. 4, Ins 3-12),
- interrupting a supply (80) to the actuator (Col. 4, Ins 54-63) in order to keep this in working order, in condition that said deviations falls outside said conditions for operation (Col. 4, Ins 39-43).

2.2 The subject-matter of claim 1 differs from this known method in that the detector is an environmental *fuse* and the active layer is *cumulatively* subjected to the component. Claim 1 is therefore new under Article 33(2) PCT.

- 2.3 The problem to be solved by the present application may be regarded as improving the known methods in order to protect the actuators also from the effects of a continuous exposure to adverse conditions, without however any additional complication in the detecting means.
- 2.4 The solution proposed in claim 1 - namely the use of an environmental fuse degraded or destroyed by the cumulative effects of the exposure - is regarded as inventive (Article 33(3) PCT) since it is not suggested or rendered obvious by any document available in the prior art. In D1 and D2, for example, the protection function is based on a substantially instantaneous measurement.
- 2.5 Similar considerations apply to independent claims 10, which refers to an environmental fuse for carrying out the method described in claim 1.

3 INDEPENDENT CLAIM 6

Claim 6 complies with the criteria of novelty and inventive step under Article 33(2) and (3) PCT. Maintenance servers for processing and storing information concerning an alarm are well-known in industrial installations, but not in combination with the claimed "environmental fuse". The requirements of Article 33(1) PCT are therefore fulfilled.

Only for sake of clarity and legibility, an explicit reference to the method of claim 1 or to the environmental fuse of claim 10 should be included in claim 6.

4 DEPENDENT CLAIMS 2-5, 7-9, 11-15, 18-29

Dependent claims 2-5, 11-15, 18-20, 22-29 are dependent on claim 6 and as such also meet the requirements of the PCT with respect to novelty and inventive step

5 INDUSTRIAL APPLICABILITY

The subject-matter of the present application relates to environmental fuses to be used in industrial installations. The requirements of Article 33(4) PCT regarding the industrial applicability are therefore fulfilled.

AP20 Rec'd PCT/PTO 27 JUL 2006

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Claims

1. A method of protecting an actuator against failure, comprising the following steps:
 - 5 - establishing a norm (206) of factors affecting the operation of the actuator (201) as based on the operating environment (301) of the actuator,
 - providing the norm (206) with a tolerance defining a condition for the operation of the actuator (201) in the operating environment (301),
 - observing the operating environment (301) of the actuator (201) in order to detect
 - 10 a deviation that falls outside said tolerance, the observation being performed by means of an environmental fuse (220) having a sensor member (204) with a first connecting surface (401) and a second connecting surface (402) for feeding a flux through them, an active layer (403) therebetween which is arranged to cause a change in the flux's passing through the active layer (403) when
 - 15 **characterized** in that the method comprises the following steps cumulatively subjecting the active layer (403) to a component present in the operating environment (301), and
 - limiting and/or interrupting a supply (203) to the actuator (201), in order to keep this in working order, in condition that said deviation falls outside said condition for
 - 20 the operation.
2. A method as defined in Claim 1, **characterized** in that the method comprises the step of generating an excitation by means of said sensor member (204).
- 25 3. A method as defined in Claim 1, **characterized** in that the method comprises generating of a response by means of a functional member (204) of the environmental fuse (202), in response to an excitation.
4. A method as defined in Claim 3, **characterized** in that said response comprises a function in which the supply (203) to the actuator (201) is limited and/or interrupted.
- 30 5. A method as defined in Claim 3, **characterized** in that said response comprises an alarm function (409).
- 35 6. A maintenance server (901), **characterized** in that it has means for processing, storing information concerning an alarm from an environmental fuse and/or for generating a response in order to limit and/or interrupt the supply to that actuator

whose environmental fuse is the source of the alarm, wherein said environmental fuse (220) has a sensor member (204) with a first connecting surface (401) and a second connecting surface (402) for feeding a flux through them, an active layer (403) therebetween which is arranged to cause a change in the flux's passing through the active layer (403) when cumulatively subjected to a component present in the operating environment (301), and means for limiting and/or interrupting a supply (203) to the actuator (201), in order to keep this in working order.

7. A maintenance server (901) as defined in Claim 6, characterized in that it is implemented with software means.

8. A maintenance server (901) as defined in Claim 6, characterized in that it has means for reporting alarm information to a data network.

9. A maintenance server (901) as defined in Claim 8, characterized in that said data network comprises one of the following: Internet, local network, network based on a cellular system and/or combination of some of these.

10. An environmental fuse (202) for protecting an actuator (201) against failure, the environmental fuse (202) having a sensor member (204) to detect a change that occurs in an environment (301) and deviates from a tolerance according to a norm (206), and a functional member (205) having functional means (408) to limit, interrupt the supply (203) to the said actuator (201) and/or to give an alarm (409), said environmental fuse being characterized in that the environmental fuse has a sensor member (204) having a first connecting surface (401) and a second connecting surface (402) for feeding a flux through them, an active layer (403) therebetween which is arranged to cause a change in the flux's passing through the active layer (403) when cumulatively subjected to a component present in the operating environment (301).

11. An environmental fuse (202) as defined in Claim 10, characterized in that it comprises a collecting arrangement for collecting a component present in the composition of the environment (301).

12. An environmental fuse (202) as defined in Claim 11, characterized in that said collecting arrangement is based on the collection of a component present in the environment (301) on a substrate through diffusion, electrical interaction, impaction, interception, filtering and/or deposition.

13. An environmental fuse (202) as defined in Claim 11, **characterized** in that the collecting arrangement has a collecting substrate comprising a wire, strip, dielectric substrate, conductive substrate and/or filter.
- 5
14. An environmental fuse (202) as defined in Claim 10, **characterized** in that the sensor member (204) is arranged to detect particulate material, gas and/or moisture.
- 15
15. An environmental fuse as defined in Claim 10, **characterized** in that said flux is a flux of electric current.
- 10
16. An environmental fuse (202) as defined in Claim 10, **characterized** in that the change in said flux's passing is based on a change of the opacity of a medium and/or an interface thereof.
- 15
17. An environmental fuse (202) as defined in Claim 16, **characterized** in that said flux is a flux of radiation.
18. An environmental fuse (202) as defined in Claim 10, **characterized** in that said actuator (201) is the controller of another actuator.
- 20
19. An environmental fuse (202) as defined in Claim 10, **characterized** in that the environmental fuse (202) has
- 25
- a first component (E1) of the sensor member (204) to detect a first change that occurs in the environment (301) and deviates from a first tolerance according a norm (206), and
 - a second component (E2) of the sensor member (204) to detect a second change that occurs in the environment (301) and deviates from a second tolerance according a norm (206).
- 30
20. An environmental fuse (202) as defined in Claim 19, **characterized** in that said first (E1) and second (E2) component (E1, E2) of the sensor member (204) are integrated into an integrated sensor member.
- 35
21. An environmental fuse (202) as defined in Claim 10, **characterized** in that the environmental fuse has
- a first functional member having functional means to limit, interrupt a first part of the supply to the actuator to be protected and/or to give an alarm, and

- a second functional member having functional means to limit, interrupt a second part of the supply to the actuator to be protected and/or to give an alarm.

22. An environmental fuse (202) as defined in Claim 10, **characterized** in that the
5 environmental fuse (202) has a modular component to be replaced with another similar component.

23. An environmental fuse (202) as defined in Claim 22, **characterized** in that the
10 the modular component of the environmental fuse (202) comprises the sensor member.

24. An environmental fuse (202) as defined in Claim 10, **characterized** in that the
environmental fuse comprises a memory for storing an environment, actuator, norm
and/or a quantity value dependent on the state of the environment.

25. An environmental fuse (202) as defined in Claim 10, **characterized** in that the
environmental fuse comprises a memory for authenticating an environment, actua-
tor, norm and/or a quantity value dependent on the state of the environment.

26. An environmental fuse (202) as defined in Claim 10, **characterized** in that the
20 sensor member (204) of the environmental fuse (202) has an active layer (403, E3)
having a capacitance, inductance and/or resistance.

27. An environmental fuse (202) as defined in Claim 26, **characterized** in that
25 said active layer (403, E3) forms part of a measuring bridge.

28. An actuator (201), **characterized** in that the actuator has an environmental
fuse (202) according to Claim 10.

29. An actuator (201) as defined in Claim 28, **characterized** in that it has an elec-
30 tric drive, power supply, drive controller, pump, fan and/or a preferred combination
of these.